USER MANUAL

NL121
Ethernet Module

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CSL 1066

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PLEASE READ FIRST

About this manual

Please note that this manual was originally produced by Campbell Scientific Inc. primarily for the North American market. Some spellings, weights and measures may reflect this origin.

Some useful conversion factors:

Area: 1 in^2 (square inch) = 645 mm^2

Length: 1 in. (inch) = 25.4 mm
1 ft (foot) = 304.8 mm
1 yard = 0.914 m
1 mile = 1.609 km

Mass: 1 oz. (ounce) = 28.35 g
1 lb (pound weight) = 0.454 kg

Pressure: 1 psi (lb/in^2) = 68.95 mb

Volume: 1 UK pint = 568.3 ml
1 UK gallon = 4.546 litres
1 US gallon = 3.785 litres

In addition, while most of the information in the manual is correct for all countries, certain information is specific to the North American market and so may not be applicable to European users.

Differences include the U.S standard external power supply details where some information (for example the AC transformer input voltage) will not be applicable for British/European use. *Please note, however, that when a power supply adapter is ordered it will be suitable for use in your country.*

Reference to some radio transmitters, digital cell phones and aerials may also not be applicable according to your locality.

Some brackets, shields and enclosure options, including wiring, are not sold as standard items in the European market; in some cases alternatives are offered. Details of the alternatives will be covered in separate manuals.

Part numbers prefixed with a "#" symbol are special order parts for use with non-EU variants or for special installations. Please quote the full part number with the # when ordering.

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For further advice or support, please contact Campbell Scientific Ltd, or your local agent.

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WHEN MEASUREMENTS MATTER

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Precautions

DANGER — MANY HAZARDS ARE ASSOCIATED WITH INSTALLING, USING, MAINTAINING, AND WORKING ON OR AROUND **TRIPODS, TOWERS, AND ANY ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC**. FAILURE TO PROPERLY AND COMPLETELY ASSEMBLE, INSTALL, OPERATE, USE, AND MAINTAIN TRIPODS, TOWERS, AND ATTACHMENTS, AND FAILURE TO HEED WARNINGS, INCREASES THE RISK OF DEATH, ACCIDENT, SERIOUS INJURY, PROPERTY DAMAGE, AND PRODUCT FAILURE. TAKE ALL REASONABLE PRECAUTIONS TO AVOID THESE HAZARDS. CHECK WITH YOUR ORGANIZATION'S SAFETY COORDINATOR (OR POLICY) FOR PROCEDURES AND REQUIRED PROTECTIVE EQUIPMENT PRIOR TO PERFORMING ANY WORK.

Use tripods, towers, and attachments to tripods and towers only for purposes for which they are designed. Do not exceed design limits. Be familiar and comply with all instructions provided in product manuals. Manuals are available at www.campbellsci.eu or by telephoning +44(0) 1509 828 888 (UK). You are responsible for conformance with governing codes and regulations, including safety regulations, and the integrity and location of structures or land to which towers, tripods, and any attachments are attached. Installation sites should be evaluated and approved by a qualified engineer. If questions or concerns arise regarding installation, use, or maintenance of tripods, towers, attachments, or electrical connections, consult with a licensed and qualified engineer or electrician.

General

- Prior to performing site or installation work, obtain required approvals and permits. Comply with all governing structure-height regulations, such as those of the FAA in the USA.
- Use only qualified personnel for installation, use, and maintenance of tripods and towers, and any attachments to tripods and towers. The use of licensed and qualified contractors is highly recommended.
- Read all applicable instructions carefully and understand procedures thoroughly before beginning work.
- Wear a **hardhat** and **eye protection**, and take **other appropriate safety precautions** while working on or around tripods and towers.
- **Do not climb** tripods or towers at any time, and prohibit climbing by other persons. Take reasonable precautions to secure tripod and tower sites from trespassers.
- Use only manufacturer recommended parts, materials, and tools.

Utility and Electrical

- **You can be killed** or sustain serious bodily injury if the tripod, tower, or attachments you are installing, constructing, using, or maintaining, or a tool, stake, or anchor, come in **contact with overhead or underground utility lines**.
- Maintain a distance of at least one-and-one-half times structure height, or 20 feet, or the distance required by applicable law, **whichever is greater**, between overhead utility lines and the structure (tripod, tower, attachments, or tools).
- Prior to performing site or installation work, inform all utility companies and have all underground utilities marked.
- Comply with all electrical codes. Electrical equipment and related grounding devices should be installed by a licensed and qualified electrician.

Elevated Work and Weather

- Exercise extreme caution when performing elevated work.
- Use appropriate equipment and safety practices.
- During installation and maintenance, keep tower and tripod sites clear of un-trained or non-essential personnel. Take precautions to prevent elevated tools and objects from dropping.
- Do not perform any work in inclement weather, including wind, rain, snow, lightning, etc.

Maintenance

- Periodically (at least yearly) check for wear and damage, including corrosion, stress cracks, frayed cables, loose cable clamps, cable tightness, etc. and take necessary corrective actions.
- Periodically (at least yearly) check electrical ground connections.

WHILE EVERY ATTEMPT IS MADE TO EMBODY THE HIGHEST DEGREE OF SAFETY IN ALL CAMPBELL SCIENTIFIC PRODUCTS, THE CUSTOMER ASSUMES ALL RISK FROM ANY INJURY RESULTING FROM IMPROPER INSTALLATION, USE, OR MAINTENANCE OF TRIPODS, TOWERS, OR ATTACHMENTS TO TRIPODS AND TOWERS SUCH AS SENSORS, CROSSARMS, ENCLOSURES, ANTENNAS, ETC.

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NL121 Ethernet Module

1. Introduction

Campbell Scientific's NL121 Ethernet Module enables Ethernet communications. It allows the datalogger to communicate over a local network or a dedicated Internet connection via Ethernet. This small, rugged communication device connects to the 40-pin peripheral port on a CR1000 or CR3000 datalogger.

This manual describes how to use *LoggerNet* to connect to your datalogger with an NL121 attached. You can also use other software packages such as *PC400*, *RTDAQ*, or *LoggerLink Mobile Apps for iOS and Android*.

Before using the NL121, please study:

- Section 2, *Cautionary Statements* ***(p. 1)***
- Section 3, *Initial Inspection* ***(p. 1)***
- Section 4, *Quickstart* ***(p. 2)***

The Quickstart section explains how to quickly begin using an NL121 for straightforward Ethernet communications. Section 6, *TCP/IP Functionality* ***(p. 9)***, describes in detail the IP functionality of the NL121.

2. Cautionary Statements

- READ AND UNDERSTAND the *Precautions* section at the front of this manual.
- The NL121 requires CR1000 or CR3000 operating system version 28 or later.
- The first time an NL121 is attached to a datalogger, the datalogger's memory has to be reorganized to allow room in memory for the IP stack. To avoid the loss of data, collect your data before attaching the NL121 to a datalogger.
- The NL121 is rugged, but it should be handled as a precision scientific instrument.
- The NL121 has integrated surge protection. In order for the surge protection to work correctly, the NL121 must be well grounded. The NL121 is grounded through the datalogger's ground lug via the thumb screw used to attach the NL121 to the datalogger. That connection is only made if the thumb screw on the NL121 is tightened down to the datalogger.
- Shielded Ethernet cable should be used for cable length longer than 2.7 m.
- Always power down the datalogger before installing or removing the NL121 to or from the datalogger.

3. Initial Inspection

Upon receipt of the NL121, inspect the packaging and contents for damage. File damage claims with the shipping company.

4. Quickstart

This section describes the basics of communicating via Ethernet with the NL121.

4.1 Physical Setup

CAUTION Always collect your data before attaching the NL121.

CAUTION Always power down the datalogger before installing or removing the NL121 to or from the datalogger.

After powering down the datalogger, plug the NL121 into the datalogger peripheral port (see Figure 4-1). Attach Ethernet cable to the Ethernet port. Restore power to the datalogger.

Figure 4-1. NL121 attached to a CR1000

4.2 Communicating via Ethernet

4.2.1 Step 1 – Configure Datalogger

a. Connect serial cable from PC COM port to datalogger **RS-232** port.

b. Open Campbell Scientific's *Device Configuration Utility* (*DevConfig*). Select the device type of the datalogger (CR1000 or CR3000), the appropriate **Communication Port**, and **Baud Rate**. **Connect** to the datalogger.

c. Under the TCP/IP tab, input the **IP Address**, **Subnet Mask**, and **IP Gateway**. These values should be provided by your network administrator.

Alternatively, note the **Eth IP** address assigned to the datalogger via DHCP. Note, however, that this address is not static and may change.

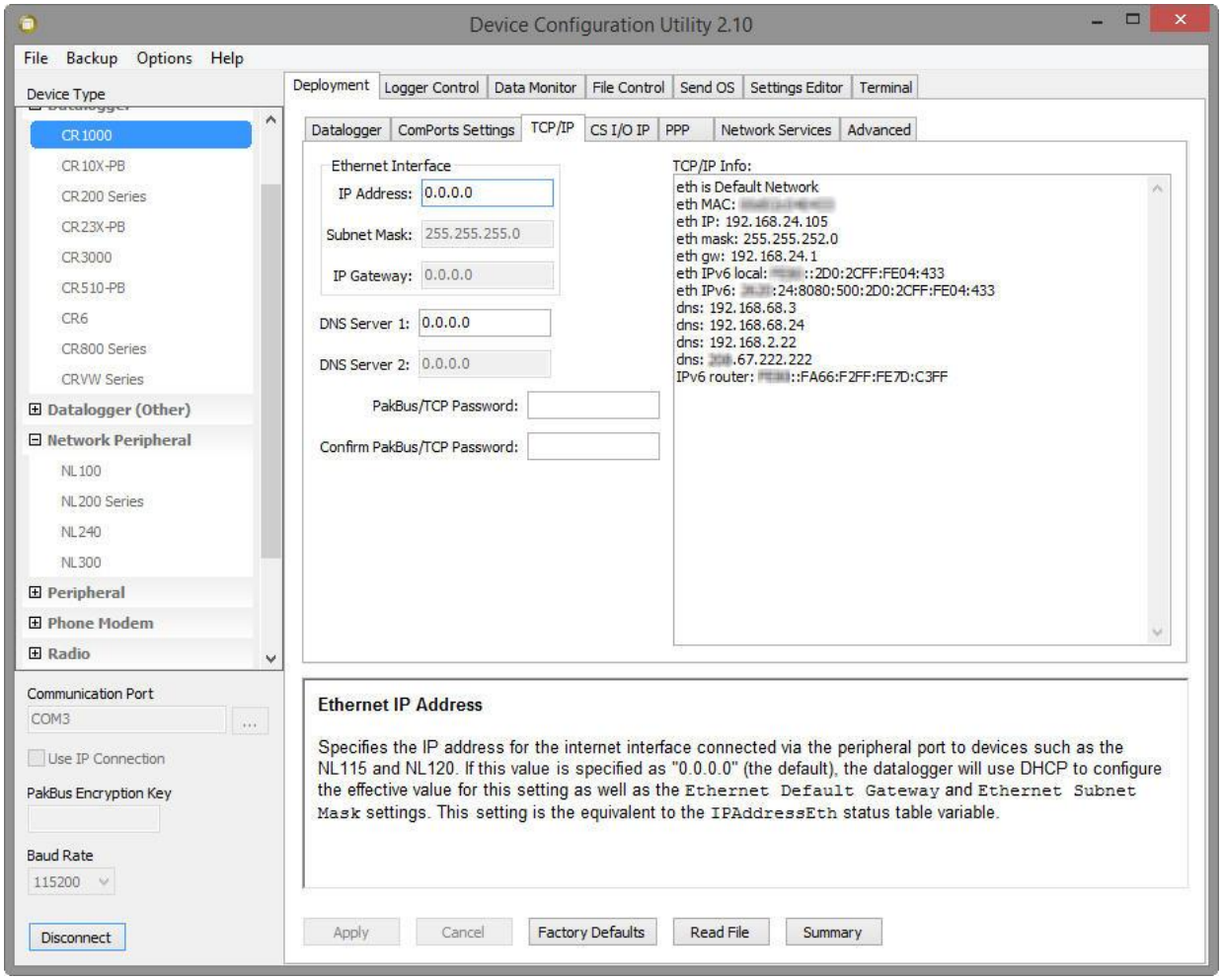

Figure 4-2. DevConfig setup

d. Press the **Apply** button to save the changes and then close *DevConfig*.

NOTE A temporary IP address may be obtained from a DHCP server. For more information, see Section 6.8, *DHCP* ***(p. 15)***.

NOTE The NL121 must be connected to the datalogger before configuring the datalogger with *DevConfig*. If it is not connected, the TCP/IP settings will not be displayed.

4.2.2 Step 2 – *LoggerNet* Setup

The next step is to run *LoggerNet* and configure it to connect to the datalogger via the Ethernet port.

a. In the *EZ View* of the *LoggerNet Setup* screen, press **Add**. Press **Next** to advance to the **Datalogger Type and Name** screen. Select your datalogger type and press **Next**.

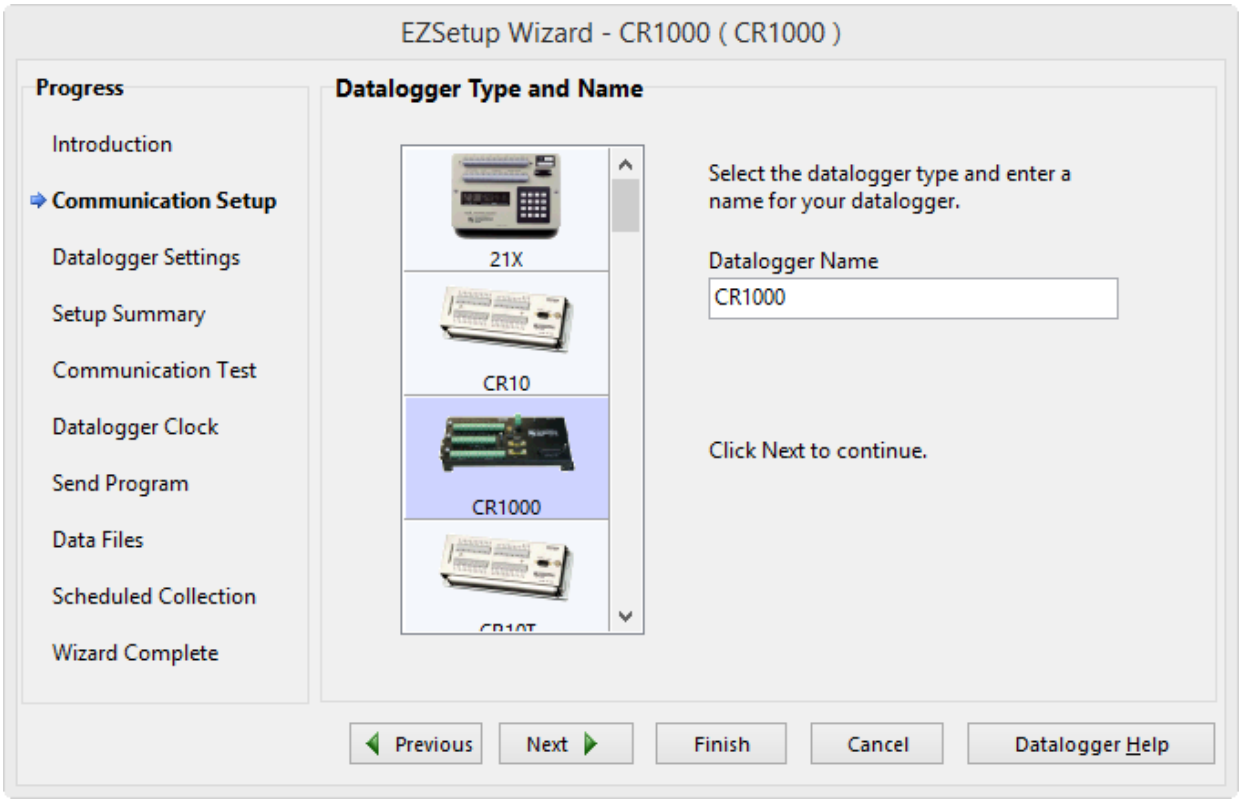

Figure 4-3. Setup screen (EZ View) Datalogger Type

b. Select **IP Port** and press **Next**.

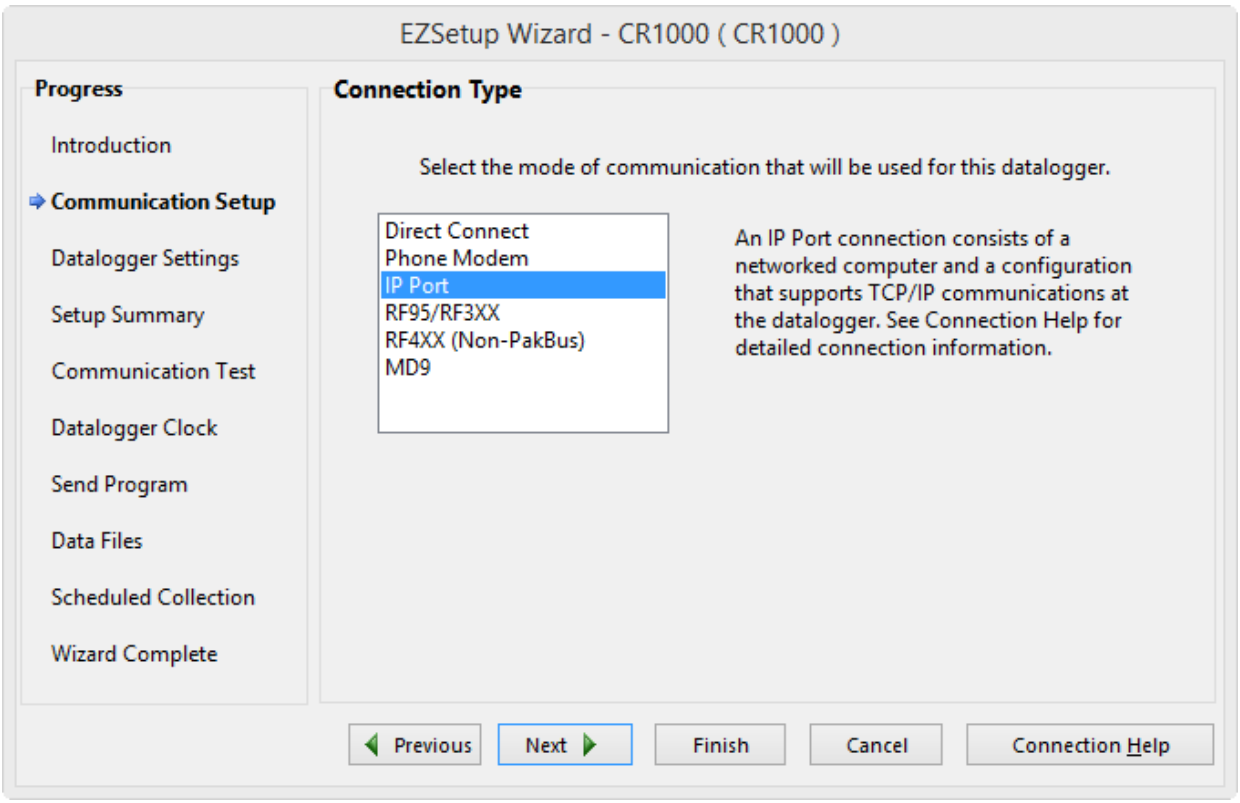

Figure 4-4. Setup screen (EZ View) Connection Type

c. Input the datalogger's IP address and port number and press **Next**. The IP address and port number are input on the same line separated by a colon. IPv6 addresses will need to be enclosed in square brackets. An IPv4 address may look like 192.168.1.100:6785. An IPv6 address may look like [2001:db8::1234:5678]:6785. (The datalogger default port number is 6785. It can be changed using *DevConfig*.)

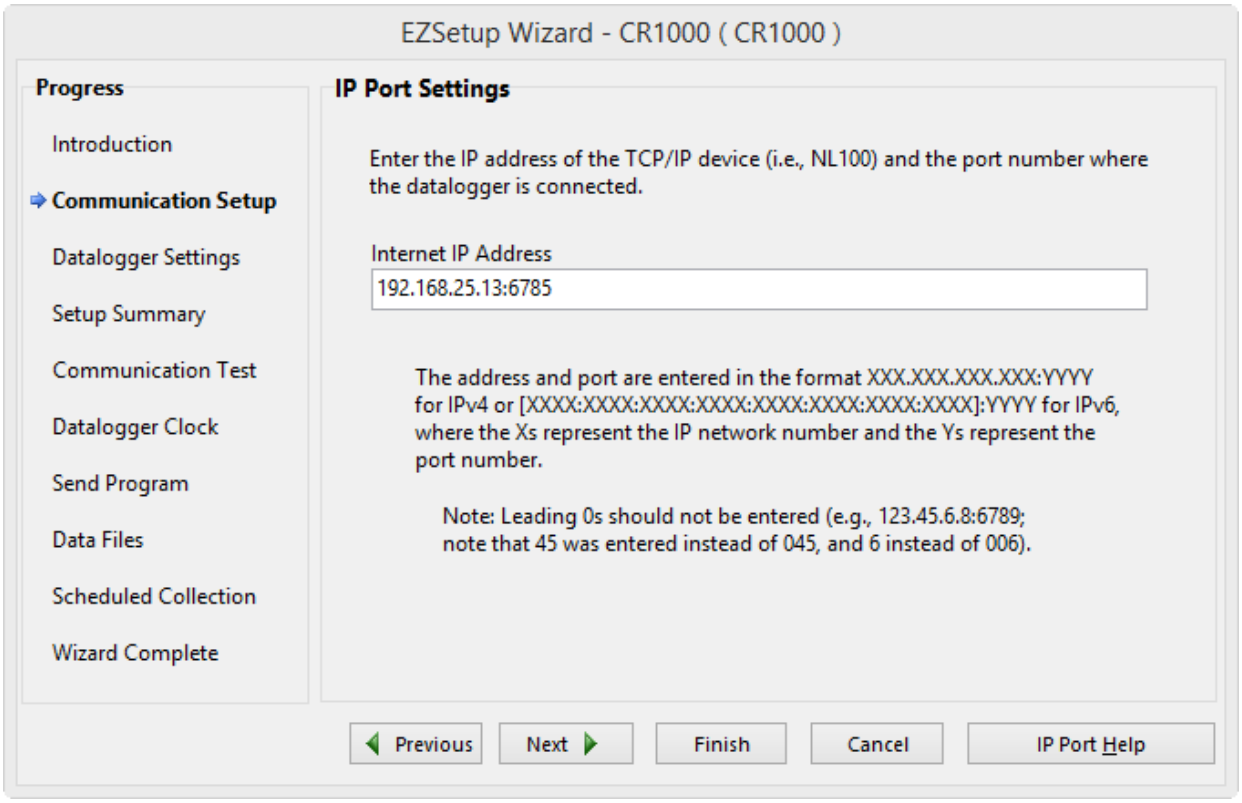
EZSetup Wizard - CR1000 (CR1000)
Progress
Introduction
Communication Setup
Datalogger Settings
Setup Summary
Communication Test
Datalogger Clock
Send Program
Data Files
Scheduled Collection
Wizard Complete
IP Port Settings
Enter the IP address of the TCP/IP device (i.e., NL100) and the port number where the datalogger is connected.
Internet IP Address
192.168.25.13:6785
The address and port are entered in the format XXX.XXX.XXX.XXX:YYYY for IPv4 or [XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX:XXXX]:YYYY for IPv6, where the Xs represent the IP network number and the Ys represent the port number.
Note: Leading 0s should not be entered (e.g., 123.45.6.8:6789; note that 45 was entered instead of 045, and 6 instead of 006).
Previous
Next
Finish
Cancel
IP Port Help

Figure 4-5. Setup screen (EZ View) IP Port Settings

d. Input the **PakBus Address** of the datalogger.

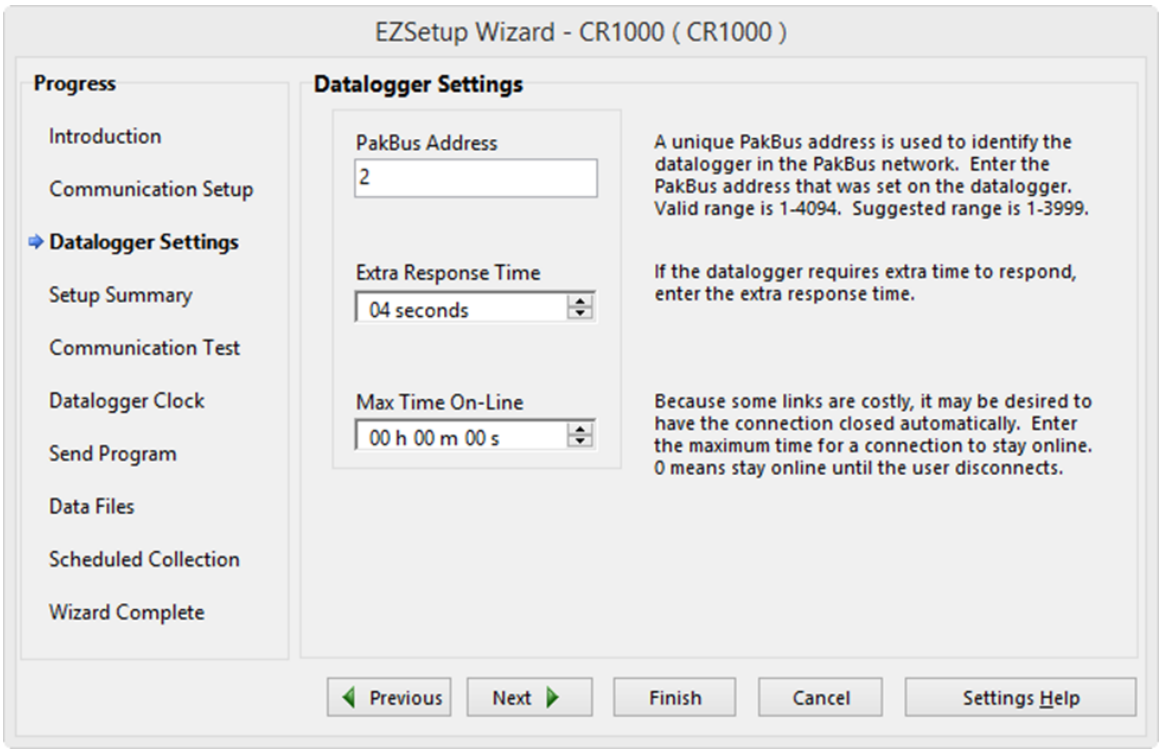
EZSetup Wizard - CR1000 (CR1000)
Progress
Introduction
Communication Setup
Datalogger Settings
Setup Summary
Communication Test
Datalogger Clock
Send Program
Data Files
Scheduled Collection
Wizard Complete
Datalogger Settings
PakBus Address
2
A unique PakBus address is used to identify the datalogger in the PakBus network. Enter the PakBus address that was set on the datalogger. Valid range is 1-4094. Suggested range is 1-3999.
Extra Response Time
04 seconds
If the datalogger requires extra time to respond, enter the extra response time.
Max Time On-Line
00 h 00 m 00 s
Because some links are costly, it may be desired to have the connection closed automatically. Enter the maximum time for a connection to stay online. 0 means stay online until the user disconnects.
Previous
Next
Finish
Cancel
Settings Help

Figure 4-6. Setup screen (EZ View) Datalogger Settings

e. Press **Next** until you reach the **Communication Setup Summary** screen. Press **Finish** to complete the setup.

4.2.3 Step 3 – Connect

You are now ready to connect to your datalogger using the *LoggerNet Connect* screen.

Datalogger program transfer, table-data display, and data collection are now possible.

5. Specifications

Datalogger Compatibility:	CR1000, CR3000 (both require OS version 28 or later)
Power Requirements:	12 V supplied through datalogger's peripheral port
Typical Current Drain:	64 mA w/Ethernet Active @ 10 Mb 58 mA w/Ethernet Active @ 100 Mb 3 mA w/Ethernet Not Active Note: Ethernet can be put into a low-power state (not connected to the network, essentially off) using the **IPNetPower()** or **EthernetPower()** instruction.
Operating Temp. Range:	–40 to 70 °C Standard –55 to 85 °C Extended

Compliance Information:	Application of Council Directive(s): 2004/108/EC Electromagnetic Compatibility Directive (EMC) Product Standard: EN 61326-1:2013 – Electrical Equipment for measurement, control and laboratory use – EMC requirements – for use in industrial locations. 2011/65/EU The Restriction of Hazardous Substances Directive (RoHS2)
Cable Requirements:	Use a straight-through Ethernet cable when the cable is run from the hub to the NL121. Use a shielded Ethernet cable when the cable length is greater than 2.7 m. Note: The maximum recommended segment length for 10BaseT and 100BaseTx networks using CAT5 cable is 100 metres. Segment length is the length of cable between the NL device and the Ethernet repeater, hub, switch, or router it is connected to.
Ethernet Speed:	10/100 Mbps (10Base-T / 100Base-Tx), full and half duplex, all auto-negotiated. Typical access speeds vary and range from 20 KBytes/sec to 200 KBytes/sec depending on multiple factors (*** see note).
Dimensions:	10.2 x 6.4 x 2.8 cm (4.0 x 2.5 x 1.1 in)
Weight:	66.6 g (2.35 oz)

*** The NL121 will automatically negotiate the speed and duplex mode used for the Ethernet link. However, the speed at which data can be transferred to and from a datalogger over the NL121 depends on multiple factors including:

- the datalogger processor speed, that is, CR1000 vs CR3000
- how busy the datalogger is performing measurement, processing, control and other communication tasks; measurement tasks take priority over communication tasks
- the IP protocol used for the data transfer and how/if the link is encrypted
- where the data is being transferred from or to, for example, USR vs CRD
- limitation of the IP connection due to congestion, the number of "hops", and the quality of the physical media between the client and host

Below are some example data transfer rates observed over an ideal connection. A laptop computer was connected directly to the NL121 interface, transferring a 1.7 MB file to and from the datalogger USR drive.

CR1000
(Sending from computer to datalogger; retrieving from datalogger to computer)

- PakBus: 30 KBytes/sec; 30 KBytes/sec
- FTP/HTTP: 55 Bytes/sec; 90 KBytes/sec

CR3000
(Sending from computer to datalogger; retrieving from datalogger to computer)

- PakBus: 65 KBytes/sec; 65 KBytes/sec
- FTP/HTTP: 135 KBytes/sec; 210 KBytes/sec

6. TCP/IP Functionality

This section describes the main TCP/IP functionality of a datalogger with an NL121 attached. Additional functionality may be added in the future. For more information, refer to the Information Services section of the datalogger manual and *CRBasic Editor* help.

6.1 Communicating over TCP/IP

Once the datalogger, the NL121, and *LoggerNet* have been set up as described in Sections 4.1, *Physical Setup* *(p. 2)*, and 4.2, *Communicating via Ethernet* *(p. 2)*, communication is possible over TCP/IP. This includes program send and data collection. These are straightforward operations and are accomplished through the *LoggerNet Connect* screen. For more information, see the *LoggerNet* manual.

Data callback and datalogger-to-datalogger communications are also possible over TCP/IP, as well as the creation of simple HTML pages to view datalogger variables using a web browser.

6.1.1 Data Callback

The following program is an example of doing data callback over TCP/IP. It first checks to see if a port to the *LoggerNet* server already exists. (The *LoggerNet* server is assumed to be at the default PakBus Address, 4094.) If not, a socket to *LoggerNet* is opened using the **TCPOpen()** instruction. The **SendVariables()** instruction is then used to send data.

PROGRAM

```
'CR1000
'IP_Callback.cr1
'LoggerNet server Pak Bus Address  assumed = 4094
'PC IP address assumed = 192.168.7.231
'LoggerNet IPPort "IP Port Used for Call-Back" = 6785
'LoggerNet IPPort "Call-Back Enabled" is checked
'LoggerNet CR1000 "Call-Back Enabled" is checked
'LoggerNet PakBusPort "PakBus Port Always Open" is checked
'IP Call-back using auto-discover (-1) neighbour in SetVariables

Public PanelTemperature, BatteryVoltage, Result1, dummy1

Dim Socket as LONG

DataTable (CLBK1,1,1000)
  DataInterval (0,0,Sec,10)
  Sample (1,PanelTemperature,FP2)
  Sample (1,BatteryVoltage,FP2)
EndTable
```

```
BeginProg

  Scan (5,Sec,6,0)

    PanelTemp (PanelTemperature,250)
    Battery (BatteryVoltage)

    If not Route(4094) then Socket = TCPOpen ("192.168.7.231",6785,0)

    SendVariables (Result1,Socket,-1,4094,0000,100,"Public","Callback",dummy1,1)

    CallTable CLBK1

  NextScan

EndProg
```

6.1.2 Datalogger-to-Datalogger Communication

Communication between dataloggers is possible over TCP/IP. In order to do this, a socket must be opened between the two dataloggers. This is done using the **TCPOpen()** instruction or using the **PakBus/TPC Client** setting. Note that only one datalogger should be set up to open the connection. The socket opened by the **TCPOpen()** instruction or the **PakBus/TPC Client** setting is then used by the instructions performing datalogger-to-datalogger communication.

The example program below gets the battery voltage from a remote datalogger and sends its panel temperature to the remote datalogger. The remote datalogger is at IP address 192.168.7.125 and port 6785 is used for communication between the dataloggers. The remote datalogger must have its battery voltage stored in a public variable, *BattVolt*. It must also have a Public variable declared, *PTemp_Base*. This will be used to store the panel temperature of the base datalogger.

PROGRAM

```
'CR1000
'DL-to-Dl_Comms_1.cr1
'Send this program to CR1000 #1
'Remote CR1000 #2 has PBA = 2, IP addr = 192.168.7.125, and port 6785

Public BattVolt,, BattVolt_Remote
Public PTemp
Public Result1, Result2

Dim Socket as LONG

DataTable (Test,1,-1)
  DataInterval (0,12,Sec,10)
    Minimum (1,BattVolt,FP2,0,False)
EndTable

BeginProg

  Scan(2,Sec,0,0)

    Socket = TCPOpen("192.168.7.125",6785,0)

    BatteryVoltage(BattVolt)
    PanelTemp(PTemp,250)
```

```
    GetVariables (Result1,Socket,-1,2,0000,50,"Public","BattVolt",BattVolt_Remote,1)
    SendVariables (Result2,Socket,-1,2,0000,50,"Public","PTemp",PTemp_Base,1)

    CallTable(Test)

  NextScan

EndProg
```

6.2 HTTP Web Server

Typing the datalogger IP address into a web browser will bring up its home page as shown in Figure 6-1. This default home page provides links to the current record in all tables, including data tables, the Status table, the DataTableInfo table, and the Public table. Clicking on a **Newest Record** link will bring up the latest record for that table. It will be automatically refreshed every 10 seconds. Links are also provided to the last 24 records in each data table. Clicking on a **Last 24 Records** link will bring up the last 24 records for that table. The **Last 24 Records** Display must be manually refreshed. In addition, links are provided to all HTML files, all XML files, and all JPEG files in the datalogger.

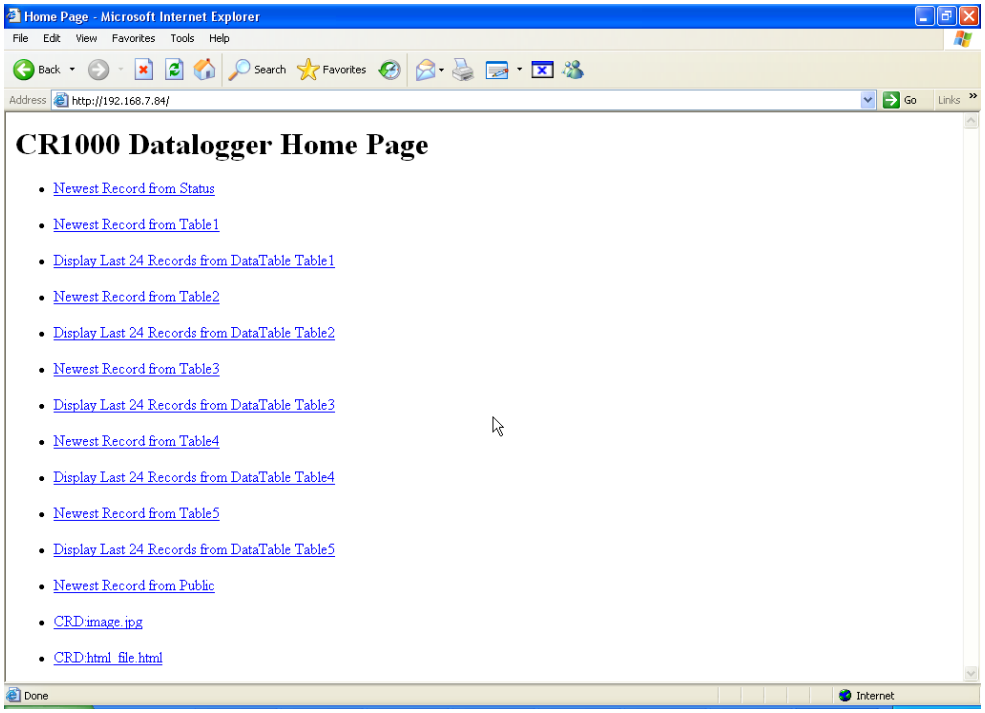
Home Page - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://192.168.7.84/
Go Links
CR1000 Datalogger Home Page
Newest Record from Status
Newest Record from Table1
Display Last 24 Records from DataTable Table1
Newest Record from Table2
Display Last 24 Records from DataTable Table2
Newest Record from Table3
Display Last 24 Records from DataTable Table3
Newest Record from Table4
Display Last 24 Records from DataTable Table4
Newest Record from Table5
Display Last 24 Records from DataTable Table5
Newest Record from Public
CRD:image.jpg
CRD:html_file.html
Done
Internet

Figure 6-1. Datalogger home page

If there is a default.html file on the datalogger, this will automatically become the user-configurable home page.

The **WebPageBegin/WebPageEnd** declarations and the **HTTPOut()** instruction can be used in a datalogger program to create HTML or XML files that can be viewed by the browser. For more information on using these instructions, see the datalogger manual or *CRBasic Editor* help.

See Web Server API in the contents of the *CRBasic Editor* help for more information on using HTTP to access datalogger data.

NOTE **FileOpen()** and **FileWrite()** can be used to create HTML pages, but this requires first writing the file to the datalogger's USR, CRD, or USB drive. It is less convenient, and the page will be only as current as it is written to the file.

6.3 FTP

6.3.1 FTP Server

With an NL121 attached, the datalogger will automatically run an FTP server. This allows Windows Explorer to access the datalogger file system via FTP. In the FTP world, the "drives" on the datalogger are mapped into directories (or folders). The "root directory" on the datalogger will include CPU and possibly USR and/or USB. The files will be contained in one of these directories. Files can be pasted and copied to/from the datalogger "drives" as if they were drives on the PC. Files on the datalogger drives can also be deleted through FTP.

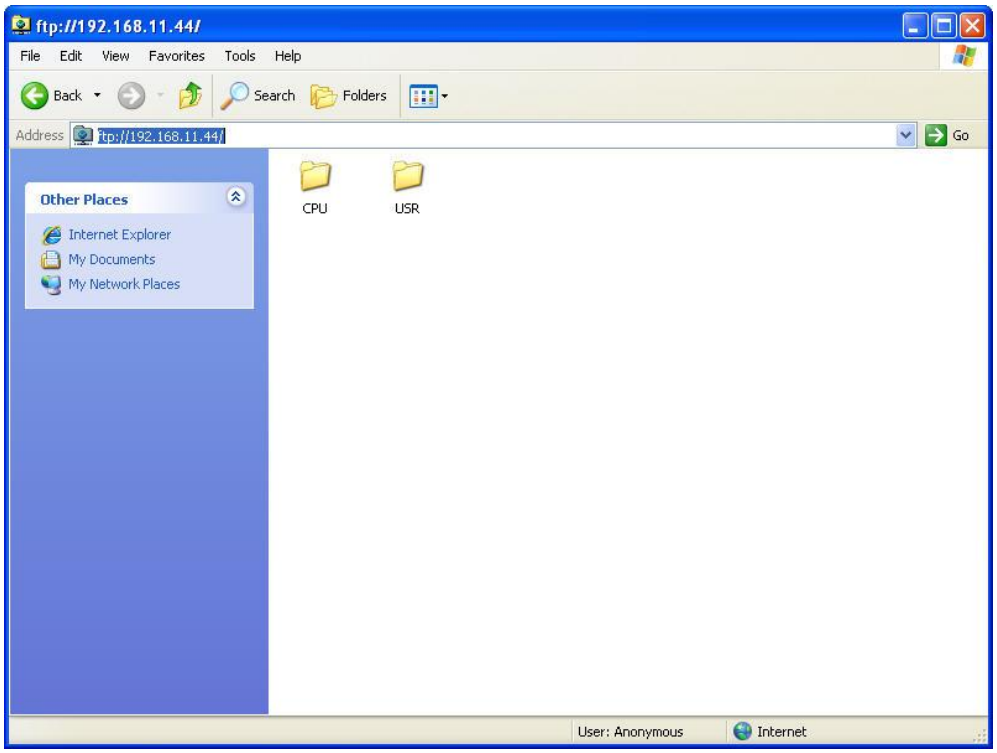

Figure 6-2. FTP root directory

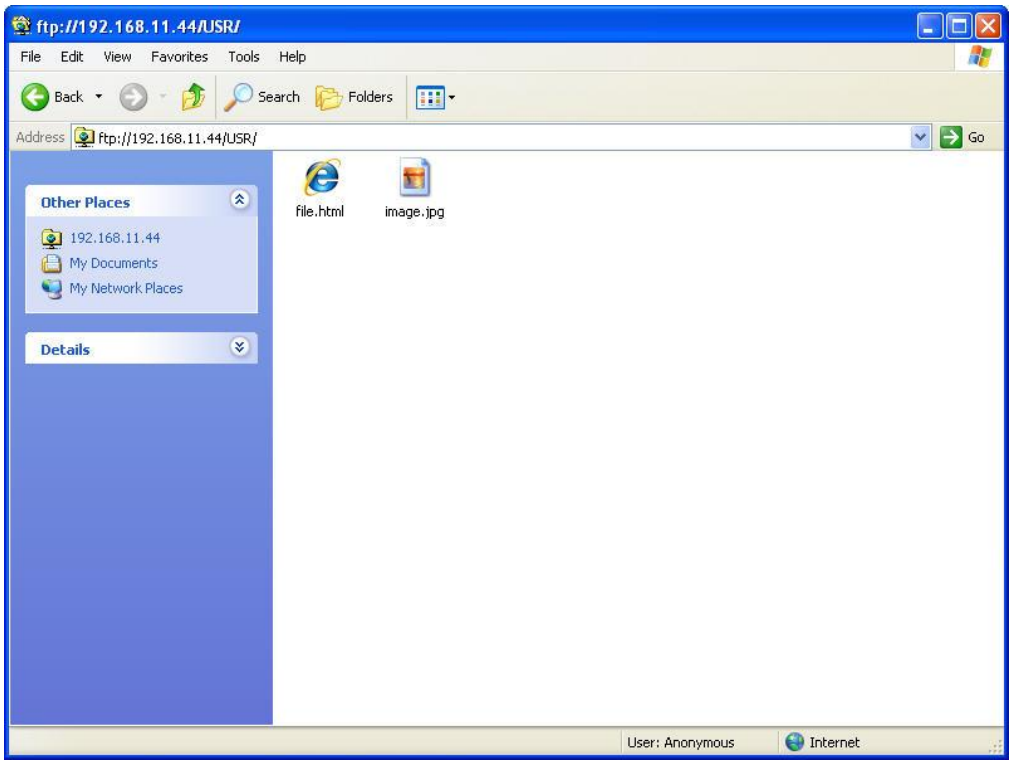

Figure 6-3. FTP USR directory

In order to use FTP, the datalogger FTP User Name and FTP Password must be set. This is done using *DevConfig*.

6.3.1.1 Step 1 – Configure Datalogger

a. Connect serial cable from PC COM port to datalogger **RS-232** port.

b. Open Campbell Scientific's *DevConfig*. Select the **Device Type** of the datalogger (CR1000 or CR3000), the appropriate **Communication Port**, and **Baud Rate**. **Connect** to the datalogger.

c. Under the **Net Services** tab, verify that **FTP Enabled** is checked. Input the **FTP User Name** and **FTP Password**.

d. Press the **Apply** button to save the changes and then close *DevConfig*.

NOTE Using **anonymous** as the user name with no password allows FTP access without inputting a user name or password.

6.3.1.2 Step 2 – Access File System

a. Datalogger must be set up for Ethernet communications as explained in Sections 4.1, *Physical Setup* (p. 2), and 4.2, *Communicating via Ethernet* (p. 2) (Step 1 only).

b. Open a Windows Explorer window. Enter **ftp://username:password@nnn.nnn.nnn.nnn** where nnn.nnn.nnn.nnn is the IP address of the datalogger.

NOTE If the user name is "anonymous" with no password, enter **ftp://nnn.nnn.nnn.nnn** where nnn.nnn.nnn.nnn is the IP address of the datalogger.

6.3.2 FTP Client

The datalogger can be an FTP client for the purpose of putting, getting, and managing files on an FTP server. It can also be used to transfer table data easily. This is done using the **FTPClient()** instruction. The following program is an example of using **FTPClient()** to send a file to another datalogger and get a file from that datalogger. For more information, see the **FTPClient()** instruction in the *CRBasic Editor* help.

PROGRAM

```
'CR1000
'FTPClient.cr1

Public Result1, Result2

BeginProg

  Scan (20,Sec,1,1)

    Result1 = FTPClient("192.168.7.85","user","password","USR:pic.jpg","USR:pic.jpg",0)
    Result2 = FTPClient("192.168.7.85","user","password","USR:file.html","USR:file.html",1)

  NextScan

EndProg
```

6.4 Telnet

Telnetting to the datalogger IP address allows access to the same commands as the Terminal Emulator in the *LoggerNet Connect* screen **Datalogger** menu.

6.5 Ping

Pinging the datalogger IP address may be used to verify communication.

6.6 Serial Server

With an NL121 attached, the datalogger can be programmed to act as a serial server over the Ethernet port. (A serial server is a device that allows serial communication over a TCP/IP port.) This function may be useful when communicating with a serial sensor over an Ethernet.

6.6.1 Serial Input

The **TCPOpen()** instruction must be used first to open a TCP socket. An example of this instruction is shown below. For more information on this instruction, see the *CRBasic Editor* help.

socket = **TCPOpen(***"",6784,100***)**

Once a socket has been opened with the **TCPOpen()** instruction, serial data may be received with a **SerialIn()** instruction. An example of this instruction is shown below. For more information on this instruction, see the *CRBasic Editor* help.

SerialIn(*Received,socket,0,13,100***)**

6.6.2 Serial Output

The **TCPOpen()** instruction must be used first to open a TCP socket. An example of this instruction is shown below. For more information on this instruction, see the *CRBasic Editor* help.

socket = **TCPOpen(***"192.168.7.85",6784,100***)**

Once a socket has been opened with the **TCPOpen()** instruction, serial data may be sent out with a **SerialOut()** instruction. An example of this instruction is shown below. For more information on this instruction, see the *CRBasic Editor* help.

result = **SerialOut(***socket,sent,"",0,100***)**

6.7 TCP ModBus

With an NL121 attached, the datalogger can be set up as a TCP ModBus Master or Slave device. For information on configuring the datalogger as a TCP ModBus Master or Slave, see the ModBus section of the datalogger manual.

6.8 DHCP

The IP address of the datalogger may be obtained through DHCP, if a DHCP server is available. The DHCP address will be automatically assigned if there is a DHCP server available and no static IP address has been entered. The IP address should be available a few minutes after the datalogger has been powered up with the NL121 attached and Ethernet cable plugged in. The IP address can be found with the *DevConfig* **Settings** tab under **TCP/IP Info**. It can also be found using a CR1000KD attached to the datalogger. Go to **Configure, Settings | Settings (general)**, scroll down to **IPInfo** and press the right arrow.

An IP address obtained through DHCP is not static but is leased for a period of time set by the network administrator. The address may change, if the datalogger is powered down.

6.9 DNS

The datalogger provides a DNS client that can query a DNS server to resolve a fully qualified domain name. When a DNS server is available, domain names can be used in place of the IP address in the datalogger instructions.

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